

Simultaneous TEMPERATURE and RH CONTROL

By Amrish Chopra

CEO - Anergy Instruments Pvt. Ltd., Faridabad

A few months back we received a call from a leading hospital in Delhi, that was facing a lot of problems in maintaining temperature & RH conditions in their operation theaters. When our engineers visited the site they found the doctors were desperate, as they were experiencing widely fluctuating conditions. In the middle of operating procedures they would suddenly find condensation on their equipment and sometimes even on their spectacle glasses. At such times where even a minor distraction can be fatal, they had to take off their spectacles to clean, which becomes a herculean task with all the gloves and other protective clothing on.

Our engineers studied the air conditioning system for the operation theaters and found that whereas modulating control was being used for the chilled water coil, the hot water coil valve was being operated through a 2-position humidistat and this mixture of modulating and 2-position control was creating the problem. A modulating control loop is designed to maintain precise conditions and, therefore, it is designed to operate at slow speed, while on the other hand, a 2-position control loop is designed to OPEN or CLOSE, as fast as possible.

In the above control scheme, whenever the RH increased, the humidistat would snap OPEN the HW valve. The opening of HW valve would add to the room heat resulting in rise in temperature. The temperature controller would sense the rise in room temperature and start opening the CHW valve, but there being a difference in the speed of operation of the two control loops, the temperature in the room would increase and the RH in the room would decrease substantially before the CHW valve could catch up with the increased load.

And the moment that happened, i.e., the RH conditions were met, the humidistat would snap the HW valve CLOSE, once again starting the above cycle in the reverse direction resulting in substantial drop in temperature & rise in RH. And this never ending cycle continued, resulting in doctors' despair.

In India, with its four distinct seasons, the ambient conditions vary to extremes

SUMMER - High temperature, low to moderate RH

MONSOON - Moderate temperature, high RH

WINTER - Low temperature, moderate to low RH

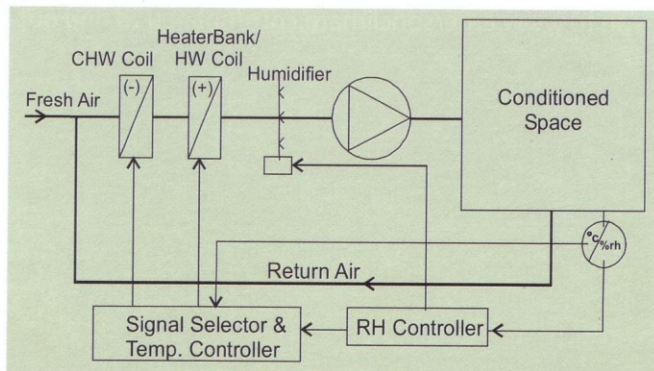
AUTUMN/SPRING - Moderate temperature, moderate RH

Operation theatres, ICUs and many pharmaceutical,

chemical and semiconductor processes require stable control of temperature & RH conditions throughout the year and the most suitable solution for simultaneously maintaining temperature & RH conditions round the year, without any manual intervention, should be :

1. Temperature controller shall have a modulating 0-10 Vdc output for cooling. Heating output shall be modulating 0-10 Vdc or ON/OFF type depending upon the type of heating equipment, hot water coil or electric heater. For multibank heaters, the modulating type, 0-10 Vdc heating output shall be used in conjunction with a step-controller.

2. RH controller shall have a modulating 0-10Vdc output for dehumidification. Humidification output shall be modulating 0-10 Vdc or ON/OFF type depending upon the type of humidification equipment, steam valve or water heater/spray bank.



The operating scheme should be:

1. During high sensible load, the cooling coil shall be operated through a temperature controller and RH controller shall operate the humidifier, if required.

2. During high latent load, the dehumidification demand will be more than the cooling demand. The signal selector will check both the cooling & the dehumidifying signals, and select the higher of the two. The cooling coil shall be operated by the higher signal.

Whenever due to high dehumidification demand the temperature tends to fall, the temperature controller shall operate the heating coil/heaters.

3. During low sensible & low latent load conditions, the temperature controller shall operate the heating coil/heaters and the RH controller shall operate the humidifier. ♦